Japanese Unexamined Patent Publication (Kokai) No. 7-89041

Publication Date: April 4, 1995

Patent Application No. 5-241451

Filing Date: September 28, 1993

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[Title of the Invention] METHOD FOR MAKING PRINTING PLATE, AND PRINTING ORIGINAL PLATE

[Abstract]

[Object] To provide (1) a plate making method capable of making a printing plate, which causes no background contamination and has high quality, by cheap and simple dry processing, and a printing original plate, and (2) a plate making method capable of making a printing plate having improved plate wear, and a printing original plat.

[Constitution] (1) A method for making a printing plate, which comprises laying a laminate comprising a transparent film having a thickness of 50 μm or less and a photocurable and photosensitive resin layer formed on the transparent film on a roughened aluminum support having surface roughness Ra of 0.1 to 0.5 μm so that the photosensitive resin layer contacts with the roughened aluminum support without heating to 45°C or higher; subjecting the laminate on the aluminum support to imagewise exposure; removing the laminate from the

aluminum support while leaving the unexposed photosensitive resin layer on the aluminum support after or during applying a pressure of 1 kg/cm^2 or more between the laminate and the aluminum support in a state of being heated to 80°C or higher; and subjecting the unexposed photosensitive resin layer left on the aluminum support to post exposure thereby to cure the photosensitive resin layer, (2) a printing original plate made by laying the laminate (1) comprising a photosensitive resin layer and a photosensitive resin layer having a minimum film forming temperature of 60°C or higher, formed on the photosensitive resin layer, on a roughened aluminum support so that the latex resin layer contacts with the roughened aluminum support without heating to 60°C or higher, and a method for making a printing plate by the method (1).

[Claims]

[Claim 1] A method for making a printing plate, which comprises laying a laminate comprising a transparent film having a thickness of 50 μm or less and a photocurable and photosensitive resin layer formed on the transparent film on a roughened aluminum support having surface roughness Ra of 0.1 to 0.5 μm so that the photosensitive resin layer contacts with the roughened aluminum support without heating to 45°C or higher; subjecting the laminate on the aluminum support to imagewise exposure; removing the laminate from the aluminum support while leaving the unexposed photosensitive resin layer on the aluminum support after or during applying a pressure of 1 kg/cm^2 or more between the laminate and the aluminum support in a state of being heated to 80°C or higher; and subjecting the unexposed photosensitive resin layer left on the aluminum support to post exposure thereby to cure the photosensitive resin layer.

[Claim 2] A printing original plate made by laying a laminate comprising a transparent film having a thickness of 50 μm or less, and a photocurable and photosensitive resin layer and a latex resin layer having a minimum film forming temperature of 60°C or higher, formed on the transparent film in this order, on a roughened aluminum support so that the latex resin layer contacts with the roughened aluminum support without heating to 60°C or higher.

[Claim 3] A method for making a printing plate, which comprises laying a laminate comprising a transparent film having a thickness of 50 μm or less, and a photocurable and photosensitive resin layer and a latex resin layer having a minimum film forming temperature of 60°C or higher, formed on the transparent film in this order, on a roughened aluminum support so that the latex resin layer contacts with the roughened aluminum support without heating to 60°C or higher; subjecting the laminate on the aluminum support to imagewise exposure; removing the laminate from the aluminum support while leaving the unexposed photosensitive resin layer and latex resin layer on the aluminum support after or during heating to 80°C or higher; and subjecting the unexposed photosensitive resin layer left on the aluminum support to post exposure thereby to cure the photosensitive resin layer.

[Detailed Description of the Invention]

[0001]

[Filed of Industrial Application] The present invention relates to a method for making a printing plate, and a printing original plate used in the plate making method. More particularly, it relates to a method for making a printing plate by dry processing, and a printing original plate used in the method.

[0002]

[Prior Art] A photosensitive resin recording material and a

silver salt photosensitive material have hitherto been used so as to make a printing plate, and there has been performed a treatment using a liquid after imagewise exposure. That is, there has been used a method of removing the non-image area with a developer solution to form relief images, using a photosensitive resin recording material, by utilizing such properties that solubility and permeability of a photosensitive resin layer to the developer solution varies due to exposure. Also there has been used a method of imagewisely depositing a lipophilic silver mirror on the hydrophilic surface in a wet state using a silver salt photosensitive material thereby to form lipophilic images. However, these methods require a treatment with a liquid and the liquid treatment yields waste fluid to cause a problem which is undesirable in view of environmental sanitation, and a problem that strict supply of a process liquid must be required to maintain activity of the process liquid constant. To avoid these problems, there is proposed a method of making a printing plate by dry processing without using a liquid.

[0003] Japanese Unexamined Patent Publication (Kokai) No. 52-9501 proposes a method comprising providing a photosensitive resin layer and a cover sheet on a grained aluminum plate, subjecting to imagewise exposure and removing the exposed photosensitive resin layer along with the cover sheet thereby to make a negative printing plate. Japanese Unexamined

Patent Publication (Kokai) No. 3-184049 and Japanese Unexamined Patent Publication (Kokai) No. 4-172351 propose a method comprising laying an imagewisely exposed photosensitive resin layer on a grained aluminum plate and transferring only the unexposed area thereby to make a printing plate.

[0004]

[Problems to be Solved by the Invention] However, according to the technique described in Japanese Unexamined Patent Publication (Kokai) No. 52-9501, since the photosensitive resin layer is provided on the grained surface by application or heat lamination, it is difficult to completely remove the photosensitive layer penetrated into the grain in the non-image area, resulting in contamination in the non-image area and poor sharpness of images. According to the methods described in Japanese Unexamined Patent Publication (Kokai) No. 3-184049 or Japanese Unexamined Patent Publication (Kokai) No. 4-172351, fog in the non-image area is less likely to occur. However, since imagewise exposure is performed via a support, good resolution is not attained. Also the development is performed on image transfer to cause a problem that accurate control of the pressure and temperature is required on transfer.

[0005] An object of the present invention is to provide a method for making a printing plate, which causes no

background contamination and has high quality, by dry processing. Another object of the present invention is to provide a method for making a printing plate by cheap dry processing. A still another of the present invention is to provide a method for making a printing plate, capable of making a printing plate by simple dry processing. A further object of the present invention is to provide a printing original plate used in the above method for making a printing plate.

[0006]

[Means for Solving the Problems] The constitutions, which attain the above objects, are the following (1) to (3).

[0007] (1) A method for making a printing plate, which comprises laying a laminate comprising a transparent film having a thickness of 50 μm or less and a photocurable and photosensitive resin layer formed on the transparent film on a roughened aluminum support having surface roughness Ra of 0.1 to 0.5 μm so that the photosensitive resin layer contacts with the roughened aluminum support without heating to 45°C or higher; subjecting the laminate on the aluminum support to imagewise exposure; removing the laminate from the aluminum support while leaving the unexposed photosensitive resin layer on the aluminum support after or during applying a pressure of 1 kg/cm^2 or more between the laminate and the aluminum support in a state of being heated to 80°C or

higher; and subjecting the unexposed photosensitive resin layer left on the aluminum support to post exposure thereby to cure the photosensitive resin layer.

[0008] (2) A printing original plate made by laying a laminate comprising a transparent film having a thickness of 50 μm or less, and a photocurable and photosensitive resin layer and a latex resin layer having a minimum film forming temperature of 60°C or higher, formed on the transparent film in this order, on a roughened aluminum support so that the latex resin layer contacts with the roughened aluminum support without heating to 60°C or higher.

[0009] (3) A method for making a printing plate, which comprises laying a laminate comprising a transparent film having a thickness of 50 μm or less, and a photocurable and photosensitive resin layer and a latex resin layer having a minimum film forming temperature of 60°C or higher, formed on the transparent film in this order, on a roughened aluminum support so that the latex resin layer contacts with the roughened aluminum support without heating to 60°C or higher; subjecting the laminate on the aluminum support to imagewise exposure; removing the laminate from the aluminum support while leaving the unexposed photosensitive resin layer and latex resin layer on the aluminum support after or during heating to 80°C or higher; and subjecting the unexposed photosensitive resin layer left on the aluminum support to

post exposure thereby to cure the photosensitive resin layer.

[0010] According to the present invention, since the photosensitive layer is provided on the grained surface by lamination at normal temperature, the photosensitive layer is not remained in the grain on peeling development and distortion of images do not occur. Since a thin film can be used as a film support, low cost is attained. The present inventors have found that the surface of the grained aluminum plate as a medium to be transferred is very important in case of lamination without heating, and thus the present invention has been completed.

[0011] The present invention will now be described in detail.

[0012] The transparent film used in the present invention may be any material as far as it does not adversely affect photographic properties and has stable size and is also transparent to light used for recording. Typical examples of the support include nitrocellulose film, triacetylcellulose film, polyvinyl acetal film, polystyrene film, polyethylene terephthalate film, polycarbonate film, and α-polyolefin film, for example, resin film such as polyethylene or polypropylene film. The surface of the support is preferably subjected to a proper backing treatment so as to improve coatability of the photosensitive layer and to improve adhesion of the photosensitive layer. Furthermore, an antihalation layer containing a dye or pigment may be provided on the surface or

back surface of the support.

[0013] The surface opposite the surface, on which the photosensitive resin layer made of a transparent film is provided, is preferably smutted so as to improve sliding properties of a recording material and to improve adhesion with a manuscript on exposure.

[0014] The thickness of the transparent film must be not more than 50 μm, and is preferably from 4 to 20 μm. When using a film having a thickness of less than 4 μm, the size of the support becomes unstable. When the thickness is more than 20 μm, image quality is deteriorated by diffusion in the film on imagewise exposure.

[0015] Examples of the composition constituting the photocurable photosensitive resin layer used in the present invention include photopolymerizable composition, photocrosslinkable composition and diazo compound. Among these compositions, a photopolymerizable composition and a photocrosslinkable composition are preferably used.

[0016] Examples of preferably used photopolymerizable composition include the followings. As a binder component, there can be used a polymer which is thermoplastic and is excellent in compatibility with a photopolymerizable component. Examples thereof include polyvinyl chloride, chlorinated polyolefin, poly(meth)acrylate ester, epoxy resin, polyurethane resin, cellulose derivative, polyamide resin,

polyvinyl-butyral resin, polyvinyl acetal resin, polyvinyl pyrrolidone, gelatin, diallyl phthalate resin, butadiene-acrylonitrile copolymer, polyvinyl acetate and vinyl versatate.

[0017] As the photopolymerizable component, the following ethylenically unsaturated compound is used. Typical examples of the compound include 2-hydroxyethyl (meth)acrylate, ethylene glycol diacrylate, diethylene glycol diacrylate, 1, 6-hexanediol di(meth)acrylate, trimethylolpropane triacrylate, pentaerythritol triacrylate, dipentaerythritol triacrylate and dipentaerythritol hexaacrylate, and these ethylenically unsaturated compounds can be use alone or in combination.

[0018] The photopolymerizable component is used in the amount of 10 to 500 parts by weight, and preferably from 30 to 200 parts by weight, based on 100 parts by weight of the binder component.

[0019] As the photopolymerization initiator, conventionally known one can be preferably used.

[0020] Specific examples thereof include benzphenone, 4,4-bis(diethylamino)benzophenone, 4-methoxy-4-dimethylaminobenzphenone, 2-ethylanthraquinone, phenanthraquinone, benzoine and benzoine methyl ether. As preferable thermal polymerization inhibitor, for example, p-methoxyphenol, hydroquinone, t-butylcatechol, pyrogallol, pyridine and aryl phosphite can be appropriately used.

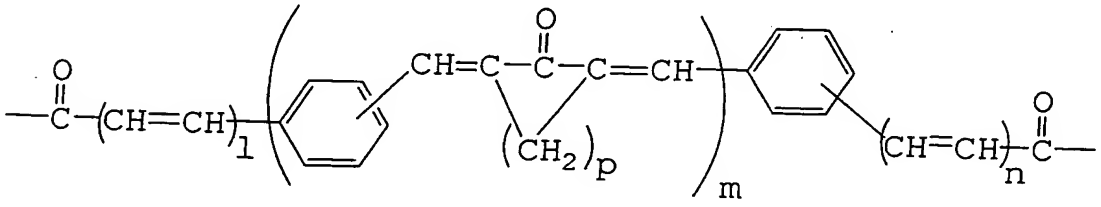
[0021] In a photopolymerizable composition, an amine compound such as Michler's ketone or 4,4'-bisdiethylaminobenzophenone can be optionally used as an auxiliary sensitizer so as to enhance sensitivity.

[0022] The thickness of the photosensitive layer is not specifically limited and is preferably about 0.5 μm. Proper coating weight varies depending on the colorant (dye or pigment) contained, and is preferably from 0.5 to 30 g/m^2. In case of application, a bar coater can be used and examples thereof include, but are not limited to, spin coater or coater similar to the spin coater.

[0023] Preferable photocrosslinkable compound used in the photocrosslinkable composition includes, for example, a polyester comprising a dicarboxylic acid unit represented by the following general formula [I], a glycol unit represented by the following general formula [II] and a glycol unit represented by the following general formula [III].

[0024]

[Chemical Formula 1]



[0025] In the general formula [I], m represents 0 or 1, l and n each represents 0 or 1 and at least one of l and n is 1

when m is 0, and l and n each represents 0 when m is 1, and p represents 2 or 3.

[0026]

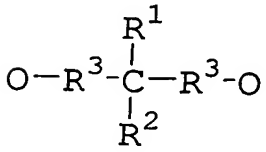
[Chemical Formula 2]

$-O-(-RO-)_r-$

[0027] In the general formula [II], R represents an alkylene group having 2 to 4 carbon atoms, and r represents 2, 3 or 4.

[0028]

[Chemical Formula 3]



[0029] In the general formula [III], R^1 and R^2 each represents a hydrogen atom or an alkyl group having 1 to 6 carbon atoms, and R^3 represents a hydrogenated benzene ring.

[0030] Examples of the dicarboxylic acid unit represented by the general formula [I] include those derived from phenylenediacrylic acid, p-carboxycinnamic acid, bis(p-carboxybenzal)cyclohexanone and bis(p-carboxybenzal)cyclopentanone. Among these, a unit derived from phenylenediacrylic acid is particularly preferable.

[0031] Examples of the glycol unit represented by the general formula [II] include those derived from diethylene glycol, triethylene glycol, tetraethylene glycol, dipropylene glycol and tripropylene glycol.

[0032] Examples of the glycol unit represented by the general formula [III] include those derived from hydrogenated bisphenol F and hydrogenated bisphenol A. The higher the hydrogenation degree, the better. Particularly preferred is a unit represented by the general formula [III] wherein R^3 is a cyclohexane ring.

[0033] The content of the glycol unit represented by the general formula [II] is preferably from 10 to 90 mol%, and more preferably from 30 to 70 mol%, based on the entire glycol units. When the content is more than the above range, chemical resistance is lowered. On the other hand, when the content is less than the above range, sensitivity is lowered.

[0034] The average molecular weight of the photosensitive polyester is not specifically limited and is preferably from 5,000 to 50,000, and particularly preferably from 9,000 to 20,000. The "average molecular weight" as used herein means a "weight-average molecular weight".

[0035] Such a photosensitive polyester can be easily prepared in accordance with a known method, for example, a method described in U.S. Patent No. 3,622,320. For example, it is prepared by dissolving a dicarboxylate ester constituting the dicarboxylic acid unit represented by the general formula [I] and a glycol mixture constituting the glycol units represented by the general formulas [II] and [III] with heating, transesterifying the mixture in the presence of

titanium-based and germanium-based catalysts, and distilling off excess glycol while gradually evacuating and heating. The reaction time is commonly about 4 hours and the temperature at the terminal of the polymerization is from 230 to 240°C, and the evacuation degree is about 3 mmHg.

[0036] The photocrosslinkable composition is commonly prepared by dissolving the photosensitive polymer in a solvent. Preferable solvent varies depending on the molecular weight and composition of the polymer, and is appropriately selected from chlorine-based solvents such as methylene chloride, chloroform, trichloroethane, trichloroethylene, chlorobenzene, dichlorobenzene and carbon tetrachloride; alcohol-based solvents such as furfuryl alcohol, tetrahydrofurfuryl alcohol and benzyl alcohol; ether-based solvents such as dioxane and tetrahydrofuran; ethylene glycol monoalkyl ether-based and diethylene glycol monoalkyl ether-based solvents, such as ethylene glycol monomethyl ether, ethylene glycol monoethyl ether, ethylene glycol monopropyl ether, ethylene glycol monobutyl ether, diethylene glycol monomethyl ether, diethylene glycol monoethyl ether, diethylene glycol monopropyl ether and diethylene glycol monobutyl ether; ester-based solvents such as ethylene glycol ethyl ether acetate, diethylene glycol ethyl ether acetate and ethyl acetate; nitrogen-containing compounds such as dimethylformamide, methyl pyrrolidone,

nitroethane and nitrobenzene; ketone-based solvent such as methyl ethyl ketone, methyl isobutyl ketone, cyclohexanone, methylcyclohexanone and 4-methyl-4-methoxy-2-pentanone; and dimethyl sulfoxide.

[0037] In addition to the above components, the photocrosslinkable composition may optionally contain various components, for example, sensitizers or phthalocyanine; pigments such as zinc oxide; and dyes such as Victoria Pure Blue BOH and Ethyl Violet.

[0038] As the sensitizer, any one used in this field can be used. For example, aromatic carbonyl compounds and aromatic nitro compounds such as benzphenone derivative, benzanthrone derivative, naphthothiazoline derivative and quinones are used.

[0039] Examples of the benzphenone derivative include Michler's ketone and diethylaminoethylbenzphenone; examples of the benzanthrone derivative include benzanthrone, 6,11-dichlorobenzanthrone, 11-chloro-6-hydroxybenzanthrone and 1-carboethoxy-2-keto-3-methyl-3-aza-1,9-benzanthrone; examples of the quinones include 1,8-dimethoxyanthraquinone, 1,8-dichloroanthraquinone and 1,2-benzanthraquinone; examples of the aromatic nitro compound include mono- and polynitro compounds such as 5-nitroacenaphthene, 2-nitrofluorene, 2,7-dinitrofluorene, 1-nitronaphthalene and 1,5-dinitronaphthalene; and examples of the naphthothiazoline

derivative include 2-dibenzoylmethylene-3-methylnaphthothiazoline, 2-benzoylmethylene-3-methylnaphthothiazoline.

[0040] A laminate can be produced by applying the photocrosslinkable composition on a transparent film by a known coating method such as dip coating, coating rod, spinner coating or spray coating in accordance with a conventional procedure.

[0041] In addition to the above compounds, the photosensitive resin layer of the present invention can contain colorants described in Japanese Unexamined Patent Publication (Kokai) No. 4-172351.

[0042] Examples of the latex having a minimum film forming temperature (MFT) of 60°C or higher of the invention according to claim 2 or 3 include water dispersions of ionomer resin, modified ionomer resin, low-molecular weight polyolefin resin, polyolefin-vinyl acetate copolymer resin and thermoplastic elastomer.

[0043] Specific examples of the compound include Copolene 2000 (ionomer resin latex, manufactured by Asahi Dow Co., Ltd., MFT: 65°C), Chemipearl W-100 (low-molecular weight polyolefin latex, manufactured by Sumitomo Chemical Industries Co., Ltd., MFT: 115°C), Chemipearl V-200 (polyolefin-vinyl acetate copolymer resin latex, manufactured by Sumitomo Chemical Industries Co., Ltd., MFT:

90°C) and Chemipearl A-100 (thermoplastic elastomer latex, manufactured by Sumitomo Chemical Industries Co., Ltd., MFT: 85°C).

[0044] When using the latex having MFT of 60°C or lower, in case of transferring of the photosensitive layer, the non-image area is not completely removed by partially forming a film on peeling development, and thus a resolving power decreases.

[0045] In the inventions of claims 1 to 3, a thermally softened layer can be optionally provided between the transparent film and the photosensitive resin layer, which constitute the laminate, so as to improve transferability to the aluminum support. This thermally softened layer is made of a thermoplastic resin and is softened when heated. As the thermally softened layer, a thermally softened layer described in Japanese Unexamined Patent Publication (Kokai) No. 4-172351 can be applied. The thermally softened layer is preferably a layer made of a polyolefin compound and is preferably made of a resin having a softening point of -30°C to 150°C.

[0046] The aluminum support used in the present invention will be described. As the base plate of the aluminum support used in the present invention, for example, there can be used a pure aluminum plate, an aluminum alloy, or metal plate, film or paper, the surface of which is coated with an

aluminum or aluminum alloy.

[0047] Among these, a base plate such as three-layered plate obtained by interposing an aluminum plate or a resin layer into aluminum or aluminum alloy plates is preferable.

[0048] In the present invention, the surface of the aluminum support is grained by a mechanical method such as brush polishing method or ball polishing method, an electrochemical method, or a combination thereof.

[0049] In case of electrolytic polishing, nitric acid, hydrochloric acid, sulfuric acid or a mixture thereof is used. Electrolytic roughening is preferably performed by dipping an aluminum support in a bath containing 0.1 to 0.5 mol/l, preferably 0.2 to 0.4 mol/l, of nitric acid under the conditions of a temperature of 20 to 50°C, preferably 25 to 45°C, a current density of 20 to 200 A/dm^2 and a treating time of about 10 seconds to 3 minutes.

[0050] Before the electrolytic etching, mechanical polishing such as ball polishing, brush polishing, buffing or liquid honing is preferably performed.

[0051] The electrolytically polished aluminum support is preferably subjected to a chemical cleaning treatment. Because the chemical cleaning treatment has an action of removing smut as the surface residue from the surface. Such the chemical cleaning treatment includes, for example, an alkali etching method described in Japanese Examined Patent

Publication (Kokoku) No. 48-28123 and a sulfuric acid desmutting method described in Japanese Examined Patent Publication (Kokoku) No. 53-12739.

[0052] After the electrolytic polishing, the aluminum support is preferably subjected to an anodizing treatment to form an anodic oxide film thereon.

[0053] The anodizing treatment can be performed by electrolyzing at an electrolytic density of 1 to 10 A/dm^2 for 10 seconds to 2 minutes using an aqueous solution containing one or more kinds of sulfuric acid, chromic acid, oxalic acid, phosphoric acid and malonic acid in a total content of 10 to 50% as an electrolytic solution and using an aluminum support as an anode. Also a method of electrolyzing in sulfuric acid at a high electrolytic density described in U.S. Patent No. 1,412,768 is used. The quantity of anodizing is suitably from 1 to 50 mg/dm^2, and preferably from 5 to 30 mg/dm^2.

[0054] It is preferred to add phosphoric acid in an electrolytic bath because of good adhesion with transferred images.

[0055] The anodized aluminum support may be further treated with an aqueous solution of alkali metal silicates described in U.S. Patent Nos. 2,714,066 and 3,181,461, for example, sodium silicate, or may be provided with an under coat made of a hydrophilic cellulose (for example, carboxymethylcellulose) containing a water-soluble metal salt

(for example, zinc acetate) described in U.S. Patent No. 3,860,426, or may be treated with polyvinylsulfonic acid described in U.S. Patent No. 4,153,461.

[0056] In the invention of claim 1, the surface roughness Ra of the aluminum support used is from 0.1 to 0.5 μm.

[0057] In case of the invention of claim 1, a hydrophilization treatment with a silicate contained in a developer, to which a conventional PS plate is subjected, is not performed, and thus hydrophilic property on printing is insufficient when Ra is less than 0.1 μm.

[0058] When Ra is more than 0.5 μm, the transferred photosensitive resin layer has partially insufficient adhesion and portion of the unexposed area may be removed upon removal of a thin film sheet from the aluminum support after imagewise exposure.

[0059] According to preferred embodiments in the inventions of claims 2 and 3, the surface roughness Ra of the aluminum support used is from 0.1 to 0.5 μm.

[0060] According to preferred embodiments in the inventions of claims 1, 2 and 3, the surface roughness Rmax of the resulting aluminum support is from 1 to 5 μm, and the number of peaks which project through a cutting plane line provided in parallel to a center line (3 μm above the center line) is substantially 0.

[0061] The surface roughness Rmax, Ra means a value defined

in the German standard DIN 3768 when the surface roughness is measured by a probe type surface roughness meter.

[0062] The peak count is defined by the above German standard and means the number of peaks which project through a cutting plane line provided in parallel to a center line in the surface roughness profile R.

[0063] The fact that the number of the peak count is substantially 0 in the present invention means that an average value of peak counts as measured by the above method in 10 or more points selected at random on the surface of the support is 0.49/mm or less.

[0064] By employing such as grained shape, transferability was particularly improved and definition was also improved.

[0065] The roughening treatment is performed so as to provide the surface of the support with hydrophilic property, and also performed so as to prevent a harmful reaction with a recording layer to be provided by transferring on the support or to improve adhesion with the recording layer.

[0066] In the present invention, on the roughened support, a water-soluble or alkali-soluble intermediate layer made of casein, polyvinyl alcohol, carboxymethylcellulose, ethylcellulose, a phenol resin, an ethylene-maleic anhydride copolymer, polyacrylic acid or polyamino acid can be optionally provided so as to improve adhesion with the support, to improve properties of removing the recording

layer, or to improve printability.

[0067] The thickness of the aluminum support is preferably from 0.2 mm to 0.5 mm, and more preferably from 0.24 to 0.3 mm. When the thickness is less than 0.24 mm, breakage of the plate may occur in case of printing a lot of prints. On the other hand, when the thickness is more than 0.3 mm, the weight of the printing original plate increases, resulting in poor handing.

[0068] Regarding the roughened aluminum support in the present invention, it is preferred that the quantity of the anodic oxide film of the roughened surface is from 5 to 30 mg/dm^2, the maximum value of Ra of the surface is not more than 5 μm, graining is performed by electrolytic polishing, electrolytic polishing is preformed in a nitric acid, and a hydrophilic polymer layer is formed on the grained surface.

[0069] The method for making a printing plate of the present invention will now be described.

[0070] First, the transparent film provided with the photocurable photosensitive resin layer is laid on the aluminum support so that the photosensitive resin layer contacts with the roughened surface of the aluminum support. A feature of the present invention is that the photosensitive resin layer is contacted with the roughened surface of the aluminum support without heating. Heating may be performed without departing from the spirit or scope of the present

invention as far as the heating temperature is lower than 45°C and does not cause a change in physical properties of the photocurable resin layer and the thermally softened layer. Also a pressure treatment may be applied, if necessary.

[0071] Next, imagewise exposure is performed. Light is not specifically limited as far as it is capable of causing the curing reaction of the photosensitive photocurable resin layer. Contact exposure may be performed via a transmission manuscript, and also line sequential or point sequential scanning exposure may be performed by a modulatable light source such as laser beam.

[0072] Then, a heat and pressure treatment are performed. It is necessary that this heat treatment is performed by heating to a temperature of 80°C or higher under a pressure of at least 1 kg/cm^2 in the invention of claim 1. When the temperature is lower than 80°C or the pressure is lower than 1 kg/cm^2, transfer from the photosensitive resin film to the aluminum support is insufficient. The temperature of the heat treatment is preferably from 100 to 160°C and the pressure of the pressure treatment is preferably from 2 to 10 kg/cm^2.

[0073] The transparent film is removed during or after the heat and pressure treatment. Preferably, the peeling treatment is performed while heating under pressure. Specifically, the transparent film is removed at the outlet

side while passing the recording material through heated roller under pressure.

[0074] In the peeling treatment, the exposed area of the photocurable resin layer is removed along with the transparent film. However, the unexposed area of the photocurable resin is transferred to the aluminum support side and remained. Furthermore, the uncured photocurable resin transferred to the aluminum support side and then entire surface exposure is performed so as to improve adhesion with the aluminum support.

[0075]

[Examples] The present invention will now be described in detail by way of examples. In the following examples, parts are by weight unless otherwise specified.

[0076] Example 1

On a polyethylene terephthalate film having a 10 μm thick under coat, a photosensitive resin composition with the following composition was applied so that the resulting coating film has a thickness of 2 μm after drying.

[0077]

SUPERCHLON CPE907LTA (chlorinated polyolefin, manufactured by Sanyo-Kokusaku Pulp Company.)	50 Parts
TMPTA (trimethylolpropane triacrylate, manufactured by Shin-nakamura Chemical Corporation)	100 Parts
Ethyl-p-aminobenzoate	3 Parts

DETX (diethylthioxanthone, manufactured by Ciba Geigy Ltd.)	3 Parts
Carnauba wax	33 Parts
Methyl ethyl ketone	1000 Parts

The resulting film was laminated on a aluminum plate having a centerline average roughness of 0.3 μm subjected to electrolytic polishing graining at 30°C while applying a pressure of 1 kg/cm^2. The aluminum plate laid on a positive transmission manuscript so that the polyethylene terephthalate film of the aluminum plate contacts with the positive transmission manuscript, and the resulting laminate was exposed to ultraviolet light from the manuscript side. The aluminum plate was heated to 120°C and then passed through rollers under pressure of 5 kg/cm^2. The polyethylene terephthalate film was removed from the aluminum plate. As a result, the exposed area was removed along with the film and the unexposed area was remained on the aluminum plate. The aluminum plate was subjected to entire surface exposure with ultraviolet light, thereby to cure the remained unexposed area.

[0078] After mounting the printing plate thus obtained to a Heidelberg GTO printing press, printing was performed. As a result, at least 100,000 prints were obtained satisfactorily.

[0079] Example 2

On a polyethylene terephthalate film having a 10 μm

thick under coat, a photosensitive resin composition with the following composition was applied so that the resulting coating film has a thickness of 2 μm after drying.

[0080]

SUPERCHLON CPE907LTA (chlorinated polyolefin, manufactured by Sanyo-Kokusaku Pulp Company.)	50 Parts
TMPTA (trimethylolpropane triacrylate, manufactured by Shin-nakamura Chemical Corporation)	100 Parts
Ethyl-p-aminobenzoate	3 Parts
DETX (diethylthioxanthone, manufactured by Ciba Geigy Ltd.)	3 Parts
Carnauba wax	33 Parts
Methyl ethyl ketone	1000 Parts

Furthermore, a Copolene latex L-2000 (40% water dispersion manufactured by Asahi Dow Co., Ltd., minimum film forming temperature: 65°C) was applied thereon in a thickness of 0.5 μm.

[0081] The resulting film was laminated on an aluminum plate having a centerline average roughness Ra of 0.3 μm subjected to electrolytic polishing graining while applying a pressure of 1 kg/cm^2. The aluminum plate was laid on a positive transmission manuscript so that the polyethylene terephthalate film of the aluminum plate contacts with the positive transmission manuscript, and the resulting laminate was exposed to ultraviolet light from the manuscript side. The aluminum plate was heated to 80°C and then passed through

rollers under pressure of 3 kg/cm^2. The polyethylene terephthalate film was removed from the aluminum plate. As a result, the exposed area was removed along with the film and the unexposed area was remained on the aluminum plate. The aluminum plate was subjected to entire surface exposure with ultraviolet light, thereby to cure the remained unexposed area.

[0082] After mounting the printing plate thus obtained to a Heidelberg GTO printing press, printing was performed. As a result, at least 100,000 prints were obtained satisfactorily.

[0083] Example 3

On a polyethylene terephthalate film having a 15 μm thick under coat, a thermally softened layer with the following composition was formed in a dry thickness of 10 μm using an extrusion lamination method.

[0084] Composition of thermally softened layer

EVAFLEX P-1405 (ethylene-vinyl acetate copolymer resin, vinyl acetate content: 14% by weight, manufactured by DU PONT-MITSUI POLYCHEMICALS)

A photosensitive resin composition with the following composition was applied thereon so that the resulting coating film has a thickness of 1.5 μm after drying.

[0085]

Composition of photosensitive layer

Vinyl acetate-vinyl versatate (80:20) copolymer resin	50 Parts
Dipentaerythritol hexaacrylate	100 Parts
Diisopropylthioxanthone	12 Parts
Ethyl-p-aminobenzoate	12 Parts
Cyanine Blue 4920(cyan pigment: manufactured by Dainichiseika Color & Chemicals Mfg. Co., Ltd.)	5 Parts
Methyl lactate	500 Parts

The resulting laminate was laid on a 0.24 mm thick aluminum plate with a grained surface having a grain roughness Ra of 0.4 μm and Rmax of 4 μm, which was subjected to brush polishing and then subjected to electrolytic polishing in a nitric acid, so that the photosensitive resin layer contacts with the grained surface of the aluminum plate, followed by contact bonding by passing through rollers under a pressure of 1 kg/cm^2.

[0086] The aluminum plate was laid on a positive transmission manuscript so that the polyethylene terephthalate film of the aluminum plate contacts with the positive transmission manuscript, and the resulting laminate was exposed to ultraviolet light from the manuscript side.

[0087] The aluminum plate was passed through rollers heated to 100°C under pressure of 3 kg/cm^2 and the polyethylene terephthalate film was removed at the outlet side of the rollers. As a result, the exposed area was removed along with the film and the unexposed area was remained on the

aluminum plate. The aluminum plate was subjected to entire surface exposure with ultraviolet light, thereby to cure the remained unexposed area.

[0088] After mounting the printing plate thus obtained to a Heidelberg GTO printing press, printing was performed. As a result, at least 100,000 prints were obtained satisfactorily.

[0089]

[Effect of the Invention] According to the inventions of claims 1 to 3, there are provided a method for making a printing plate by dry processing, capable of exerting the following effects (1) to (3), and a printing original plate. According to the inventions of claims 2 and 3, the following effect (4) is further exerted.

[0090] (1) There is obtained a printing plate which does not cause background contamination and has high quality.

[0091] (2) Cost can be reduced by using a film having a thickness smaller than that of a conventional one as a support of the photosensitive resin layer.

[0092] (3) Necessity to accurately control the conditions on image transfer decreases and thus simple processing can be performed.

[0093] (4) A printing plate having improved plate wear is obtained.